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EXAMINER	
SHEW, JOHN	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/807,959	Applicant(s) BARTON ET AL.	
	Examiner John L. Shew	Art Unit 2664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 31 January 2006.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 05 August 2005 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 12032002.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Applicant's arguments with respect to claims 1, 15 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 15 is rejected under 35 U.S.C. 102(e) as being anticipated by Nakamura et al. (Patent No. 6108353).

Claim 15, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-18) referenced by a synchronization signal generating means, representing a symbol boundary in an OFDM signal (Abstract lines 1-23, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data

period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, said signal comprising symbols (FIG. 1, column 2 lines 7-16) referenced by the Effective Symbol, each symbol being formed of successive complex samples (FIG. 4, column 6 lines 59-67) referenced by the IQ Modulating Circuit 21 to form real portion and imaginary portion signals, each of said successive complex samples having a sample period (FIG. 1, column 1 lines 40-52) referenced by the OFDM modulation in modes 1-4 with each mode representative of a fixed number of symbols per frame for a defined sample period, and each symbol including useful symbol periods (FIG. 1, column 2 lines 7-16) referenced by the useful symbol represented by the Effective Symbol, said useful symbol periods being separated by guard spaces (FIG. 1, column 2 lines 7-16) referenced by the Effective Symbol Interval separated by the Guard Interval, with data in each guard space corresponding to part of the data in a respective useful symbol period (FIG. 1, column 2 lines 7-16) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the method including the step of adjusting the timing of the synchronization pulse in units of multiple sample periods (column 8 lines 33-51) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 22, 12, 16, 13, 14, 17, 18, 23, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al. (Patent No. 6108353) as applied to claim 15 above, in view of Stott et a. (Patent No. US 6628730).

Claim 1, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-18) referenced by a correlation circuit for generating a synchronization signal, representing a symbol boundary in an OFDM signal (Abstract lines 1-23, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval separated by Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 7-16) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the

method comprising providing a signal representing the degree of correlation between samples of a received signal which are separated by a period corresponding to the useful part of the symbol (FIG. 2A, FIG. 2B, FIG. 2C, column 2 lines 17-35) referenced by the Correlation Signal generated by the Original Signal to the Delayed Signal wherein the Guard Interval is correlated to the end of the Effective Symbol, the signal thus providing an output representing for each symbol an interval during which significant correlation is found (FIG. 2D, column 2 lines 36-44) referenced by the integration of the correlation signal to find significant correlation during the interval, the method comprising detecting a sub-interval within which a maximum degree of correlation occurs (column 5 lines 5-8, FIG. 6C, column 7 lines 54-61) referenced by the subinterval Tc/2 or defined by half of the Guard Interval Tc wherein the peak correlation occurs, and providing a synchronization pulse within the detected sub-interval (FIG. 6E, FIG. 6F, column 7 lines 54-67, column 8 lines 1-9) referenced by the output Correlation Signal and Signal of Integration during the subinterval. Nakamura does not teach a method comprising determining respective degrees of correlation in each of plural subintervals with said interval.

Stott teaches a method comprising determining respective degrees of correlation in each of plural subintervals with said interval (FIG. 7, FIG. 8, column 7 lines 61-67, column 8 lines 1-19) referenced by the ZOOM process to converge on the timing process around the region of interest wherein the rising edge of the correlation signal is located.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 2, Nakamura teaches wherein the detected sub-interval is determined by applying a threshold to the signal representing the degree of correlation (FIG. 6F, column 8 lines 10-26) referenced by the TH threshold of the interval integration slightly lower than the amplitude of the triangular integrated signal.

Claim 3, Nakamura teaches wherein the threshold is varied (column 8 lines 10-32) referenced by the determination of the threshold for removing noise with noise being variable thereby the determination of the threshold is variable.

Claim 4, Nakamura teaches wherein the threshold represents a value which is dependent upon the maximum value of the signal representing the degree of correlation (FIG. 6E, FIG. 6F, column 8 line 10-26) referenced by the threshold TH being slightly lower than the amplitude of the triangular wave signal which represents the maximum degree of correlation.

Claim 5, Nakamura teaches the signal representing the degree of correlation is subject to filtering prior to using the signal to determine said detected sub-interval (FIG. 5) referenced by the filtering action of Correlators 47 46 prior to the Integration by Parts unit 48 which outputs a signal representing the degree of correlation, the filtering being such that each filtered output sample represents substantially an average of a predetermined number of successive samples (FIG. 5, column 8 lines 41-51) referenced by Averaging Circuit 49 of the time synchronization signals wherein the number used for averaging is predetermined to be 76, said predetermined number being substantially less than the number of samples within a guard space (column 8 lines 41-51) referenced by the reduced number of samples at 15.

Claim 6, Nakamura teaches the filtered output represents values averaged over a plurality of symbols (column 8 lines 41-51) referenced by the averaging circuit output averages the time synchronization signals of the respective predetermined number of symbols.

Claim 7, Nakamura teaches an OFDM demodulating apparatus. Nakamura does not teach the number of symbols over which the filtered output values are averaged increases during an acquisition stage and in which the filtering is adjusted during that acquisition stage so as to decrease the number of successive samples.

Stott teaches the number of symbols over which the filtered output values are averaged increases during an acquisition stage (FIG. 10, column 7 lines 49-56, column 9 lines 25-

53) referenced by the Correlator 74 in the acquisition HUNT state in which all the signals for the Frequency Synchronization unit memories 52 54 are correlated, and in which the filtering is adjusted during that acquisition stage so as to decrease the number of successive samples (FIG. 11, column 7 lines 49-56, column 9 lines 25-53) referenced by the transition to the ZOOM state in which the correlator 74 only considers a subset of the signal defined by the ZOOM window and gets direct samples from it's internal small buffer, the average of which is represented by each filtered output sample (FIG. 12, column 8 lines 65-67, column 9 lines 1-10) referenced by the averaging by the High Pass Recursive filter 80 followed by the IIR Symbol Filter 82.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 8, Nakamura teaches wherein the filtered output is subjected to further filtering before being processed to provide a signal representing a fine frequency offset (FIG. 5, column 8 lines 52-67) referenced by the further filtering action of the Phase Discriminating/Frequency Sinc unit 51 to provide an AFC frequency signal adjustment to the RF Amplifier/Frequency Converter unit 32.

Claim 9, Nakamura teaches an OFDM demodulating apparatus. Nakamura does not teach the step of adjusting the timing of the synchronization pulse only if a calculated error in the current timing exceeds a predetermined threshold.

Stott teaches the step of adjusting the timing of the synchronization pulse only if a calculated error in the current timing exceeds a predetermined threshold (column 8 lines 20-33, column 51-64) referenced by the calculated error in the timing based on the DELTA count which reflects a loss of pulse synchronization through a pulse unlock event and wherein the transition to the HUNT state to obtain timing synchronization if a predetermined number of DELTA counts is exceeded.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 10, Nakamura teaches an OFDM demodulating apparatus. Nakamura does not teach the step of adjusting the timing of the synchronization pulse only if the current timing is determined to be in error over a predetermined number of symbol periods.

Stott teaches the step of adjusting the timing of the synchronization pulse only if the current timing is determined to be in error over a predetermined number of symbol periods the predetermined number of symbol periods being greater than one (column 8

lines 20-33) referenced by the state machine transition from the ZOOM to the HUNT state such that the timing process is unlocked and wherein the transition occurs when a number of DELTA consecutive pulse unlock event occurs representative of timing errors with the DELTA set at 4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 11, Nakamura teaches wherein the timing of the synchronisation pulse is adjusted in predetermined quantities corresponding to a plurality of sample periods (column 8 lines 33-52) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim 22, Nakamura teaches an apparatus for generating a synchronizing pulse (FIG. 5) referenced by the reception (demodulating) apparatus with the Time Sync Signal Generating Circuit 48.

Claim 12, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-18) referenced by a correlation circuit for generating a synchronization signal, representing a symbol boundary in an OFDM signal (Abstract lines 1-24, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval and Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 7-16) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side. Nakamura does not teach the method including the step of (i) calculating the error in the current timing. Stott teaches a method including the step of (i) calculating the error in the current timing (column 8 lines 20-33) referenced by the ZOOM state with the DELTA count determining the number of pulse unlock events occurring, (ii) comparing the calculated error with a predetermined threshold (column 8 lines 20-33) referenced by comparison of the DELTA count to a predetermined value of 4, and (iii) adjusting the timing of the synchronization pulse in response to the calculated error exceeding said predetermined threshold (column 8 lines 20-33, lines 51-64) referenced by the transition from the ZOOM state to the HUNT state if the DELTA count is exceeded in order to retrack the timing of the rising edge of the correlated signal.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 16, Nakamura teaches wherein the timing of the synchronisation pulse is adjusted in predetermined quantities corresponding to a plurality of sample periods (column 8 lines 33-52) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim 13, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-18) referenced by a correlation circuit for generating a synchronization signal, representing a symbol boundary in an OFDM signal (Abstract lines 1-24, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval and Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 7-16) referenced by the symbol end

side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side. Nakamura does not teach the method including the step of (i) counting the number of symbol periods over which the current timing is determined to be in error.

Stott teaches a method including the step of (i) counting the number of symbol periods over which the current timing is determined to be in error (column 8 lines 20-33) referenced by the ZOOM state with the DELTA count determining the number of pulse unlock events occurring wherein each pulse is representative of a symbol sync pulse, and (ii) adjusting the timing of the synchronization pulse in response to the counted symbol periods exceeding a predetermined number greater than one (column 8 lines 20-33, lines 51-64) referenced by the transition from the ZOOM state to the HUNT state if the DELTA count value of 4 is exceeded in order to retrack the timing of the rising edge of the correlated signal.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 14, Nakamura teaches an OFDM demodulating apparatus. Nakamura does not teach wherein the timing of the synchronization pulse is adjusted in response to the

current timing having an error exceeding a predetermined threshold over said predetermined number of symbol periods.

Stott teaches wherein the timing of the synchronization pulse is adjusted in response to the current timing having an error exceeding a predetermined threshold over said predetermined number of symbol periods (column 8 lines 20-33, lines 51-64) referenced by the transition from the ZOOM state to the HUNT state if the DELTA predetermined threshold count value of 4 is exceeded in order to retrack the timing of the rising edge of the correlated signal for each symbol period.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 17, Nakamura teaches a method of receiving an OFDM signal (Abstract lines 1-18, FIG. 5, column 5 lines 29-31, column 7 lines 8-19) referenced by the OFDM demodulating receiver apparatus, the method including the step of generating a synchronization pulse (Abstract lines 1-18) referenced by a synchronization signal generating circuit, and using the synchronization pulse in order to apply a Fast Fourier Transform to complex samples derived from the OFDM signal (FIG. 5, column 8 lines

41-51) referenced by the synchronization pulse from the Averaging Circuit 49 to the FFT Circuit 35 to adjust the timing of the OFDM signal at Antenna 31.

Claim 18, Nakamura teaches further including the step of providing when the timing of the synchronization pulse is altered a signal representing the degree of alteration (FIG. 5, FIG. 6E, column 8 lines 10-22) referenced by the Rough Sync. Signal and the alteration of the signal by the Time Sync Signal Generating Circuit 48. Nakamura does not teach applying to the transformed samples phase rotations determined by this signal.

Stott teaches applying to the transformed samples phase rotations determined by this signal (FIG. 2 column 4 lines 34-56) referenced by the phase error correction block 30 which receives the time sync 26 through the FFT 24.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Claim 23, Nakamura teaches an OFDM apparatus for receiving an OFDM signal (Abstract lines 1-18, FIG. 5, column 5 lines 29-31, column 7 lines 8-19) referenced by the OFDM demodulating receiver apparatus.

Claim 20, Nakamura teaches a method of receiving an OFDM signal (Abstract lines 1-23, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, the method including the steps of generating a synchronization pulse (Abstract lines1-18) referenced by a synchronization signal generating circuit, and using the synchronization pulse in order to apply a Fast Fourier Transform to complex samples derived from the OFDM signal (FIG. 5, column 8 lines 41-51) referenced by the synchronization pulse from the Averaging Circuit 49 to the FFT Circuit 35 to adjust the timing of the OFDM signal at Antenna 31, the method further including the step of providing when the timing of the synchronization pulse is altered a signal representing the degree of alteration (FIG. 5, FIG. 6E, column 8 lines 10-22) referenced by the Rough Sync. Signal and the alteration of the signal by the Time Sync Signal Generating Circuit 48. Nakamura does not teach applying to the transformed samples phase rotations determined by this signal.

Stott teaches applying to the transformed samples phase rotations determined by this signal (FIG. 2 column 4 lines 34-56) referenced by the phase error correction block 30 which receives the time sync 26 through the FFT 24.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which

may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

2. Claims 19, 21, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura and Stott as applied to claims 15, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 22, 12, 16, 13, 14, 17, 18, 20 above, and further in view of Park et al. (Patent No. US 6470030 B1).

Claims 19, 21 Nakamura teaches a demodulating apparatus for OFDM signals including phase discrimination. He does not teach phase rotations are determined by values in a lookup table.

Park teaches the phase rotations are determined by values in a look-up table addressed in accordance with the signal representing the degree of alteration of the synchronization pulse timing (FIG. 1, column 3 lines 64-67, column 4 lines 1-8, column 5 lines 10-14) referenced by the phase memory 560 of a lookup table for phase error estimation for synchronization.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the phase memory of Park to the OFDM demodulating apparatus of Nakamura and Stott for the purpose of providing an OFDM receiver with

an optimal structure of resource utilization efficiency and chip area as suggested by Park (column 2 lines 8-16).

Claim 24, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-18) referenced by a correlation circuit for generating a synchronization signal, representing a symbol boundary in an OFDM signal (Abstract lines 1-23, Fig. 1, col. 2 lines 7-16) referenced by the demodulation apparatus for correlation between the OFDM data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval separated by Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 7-16) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the method including the steps of receiving an OFDM signal by generating the synchronization pulse (Abstract lines 1-18, FIG. 5, column 5 lines 29-31, column 7 lines 8-19) referenced by the OFDM demodulating receiver apparatus with a synchronization signal generating circuit, using the synchronization pulse in order to apply a Fast Fourier Transform to complex samples derived from the OFDM signal (FIG. 5, column 8 lines 41-51) referenced by the synchronization pulse from the Averaging Circuit 49 to the FFT Circuit 35 to adjust the timing of the OFDM signal at Antenna 31, providing when the timing of the synchronisation pulse is altered a signal representing the degree of

alteration (FIG. 5, FIG. 6E, column 8 lines 10-22) referenced by the Rough Sync. Signal and the alteration of the signal by the Time Sync Signal Generating Circuit 48.

Nakamura does not teach adjusting the timing of the synchronization pulse in predetermined quantities corresponding to a plurality of sample periods nor applying to the transformed samples phase rotations determined by the signal.

Stott teaches adjusting the timing of the synchronization pulse in predetermined quantities corresponding to a plurality of sample periods (FIG. 8, column 11 lines 11-19) referenced by the sync section with the fine time synchronization FTIME an interger multiple adjusted to the sample index by the controller 570.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the mode for analyzing the digital sample values over a relatively narrow range of Stott to the OFDM demodulating apparatus of Nakamura for the purpose of providing a demodulator for data transmitted by a COFDM system which may be manufactured simply and inexpensively as suggested by Stott (column 2 lines 34-38).

Park teaches applying to the transformed samples phase rotations determined by the signal (FIG. 1, column 3 lines 64-67, column 4 lines 1-8, column 5 lines 10-14) referenced by the phase memory 560 of a lookup table for phase error estimation for synchronization.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the phase memory of Park to the OFDM demodulating apparatus of Nakamura and Stott for the purpose of providing an OFDM receiver with

an optimal structure of resource utilization efficiency and chip area as suggested by Park (column 2 lines 8-16).

Claim 25, Nakamura teaches a demodulating apparatus for OFDM signals including phase discrimination. He does not teach phase rotations are determined by values in a lookup table.

Park teaches the phase rotations are determined by values in a look-up table addressed in accordance with the signal representing the degree of alteration of the synchronization pulse timing (FIG. 1, column 3 lines 64-67, column 4 lines 1-8, column 5 lines 10-14) referenced by the phase memory 560 of a lookup table for phase error estimation for synchronization.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the phase memory of Park to the OFDM demodulating apparatus of Nakamura and Stott for the purpose of providing an OFDM receiver with an optimal structure of resource utilization efficiency and chip area as suggested by Park (column 2 lines 8-16).

Citation of Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patent No. 5602835, Seki et al. discloses an OFDM synchronization demodulation circuit. Patent No. 5818813, Saito et al. discloses an orthogonal frequency division multiplexing transmission system and transmitter and receiver adapted to the same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John L. Shew whose telephone number is 571-272-3137. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on 571-272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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FRANK DUONG
PRIMARY EXAMINER